

## Chemicals of Concern for Site Contaminated with Petroleum Hydrocarbons Regulated Under IC 13-11 and 329 IAC 9

### Introduction

RISC identifies specific contaminants associated with petroleum hydrocarbon products. These contaminants are referred to in this appendix as chemicals of concern (COC). Petroleum hydrocarbon products are defined as virgin petroleum fuels or virgin lubrication oils. For the purpose of classifying COCs, the following categories of petroleum products are recognized: gasoline, high-end liquid hydrocarbon fuels, and hydrocarbon oils. The COCs for these categories of petroleum products are listed below. Table 4.1-1 lists the petroleum COCs and includes their default closure levels. Table 4.1-2 lists 0.25-acre source size migration to ground water closure levels. Only the migration to ground water exposure level for a 0.25-acre source has been calculated. The closure levels for other exposure routes are listed in Table 4.1-1. A different closure level can be calculated by using site-specific data in the default equations or by eliminating an exposure pathway (such as direct contact).

### Gasoline

- Methyl tertiary butyl ether (MTBE)
- Benzene, toluene, ethylbenzene, and xylene (BTEX)

### High-End Liquid Hydrocarbon Fuels

High-end liquid hydrocarbon fuels include diesel, No. 2 fuel oil, kerosene, aviation gasoline, and jet fuels. The COCs for this category are BTEX and the following Class B2 carcinogenic polynuclear aromatic hydrocarbons (cPAHs):

- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzo(a)pyrene
- Chrysene
- Dibenz(a,h)anthracene
- Indeno(1,2,3-cd)pyrene

### Hydrocarbon Oils

Hydrocarbon oils are fuel and lubrication oils such as virgin motor oil and fuel oils No. 4, 5, and 6 (bunker oil). These oils are composed of complex petroleum hydrocarbon constituents. The COCs for this category are the cPAHs.

**Table 4.1-1. Petroleum COC Default Closure Levels - Commercial / Industrial**

Petroleum COC	Soil Exposure							Ground Water				
	Soil Attenuation Capacity (mg/kg)	Soil Saturation (mg/kg)	Construction Worker (mg/kg)	Direct Contact (mg/kg)	Migration to Ground Water (mg/kg)	Default (mg/kg)	Detection Limit (mg/kg)	Solubility (mg/L)	MCL (mg/L)	Commercial/Industrial Use (mg/L)	Default (mg/L)	Detection Limit (mg/kg)
Benzo(a)anthracene	6,000/2,000		790 c	15 c	62 c	15 c	0.009	0.0094		0.0039 c	0.0039 c	0.0002
Benzene	6,000/2,000	870	120	13 c	0.67 c	0.67 c	0.005	1,800	0.005	0.099 c	0.099 c	0.005
Benzo(b)fluoranthene	6,000/2,000		790 c	15 c	74 c	15 c	0.012	0.0015		0.0039 c	0.0015 c	0.0002
Benzo(k)fluoranthene	6,000/2,000		7,900 c	150 c	39 c	39 c	0.012	0.0008		0.039 c	0.0008 c	0.0002
Benzo(a)pyrene	6,000/2,000		79 c	1.5 c	16 c	1.5 c	0.016	0.0016	0.0002	0.00039 c	0.00039 c	0.0002
Chrysene	6,000/2,000		79,000 c	1,500 c	25 c	25c	0.100	0.0016		0.39 c	0.0016 c	0.0015
Dibenz(a,h)anthracene	6,000/2,000		79 c	1.5 c	60 c	1.5 c	0.020	0.0025		0.00039 c	0.00039 c	0.0002
Ethylbenzene	6,000/2,000	400	29,000	6,800	200	200	0.005	170	0.7	10	10	0.005
Indeno(1,2,3-cd)pyrene	6,000/2,000		790 c	15 c	3.1 c	3.1 c	0.030	0.000022		0.0039 c	0.000022 c	0.0002
MTBE	6,000/2,000	32,000	38,000 c	330 c	5.6 c	5.6 c	0.005	48,000		0.72 c	0.72 c	0.005
Toluene	6,000/2,000	650	11,000	2,200	240	240	0.005	530	1	20	20	0.005
Xylenes (mixed)	6,000/2,000	410	34,000	6,200	3,400	410	0.005	180	10	200	180	0.005

Notes:

- c = Carcinogen
- MCL = Maximum contaminant level
- mg/kg = Milligram per kilogram
- mg/L = Milligram per liter

**Table 4.1-1. Petroleum COC Default Closure Levels - Residential**

Petroleum COC	Soil Exposure							Ground Water				
	Soil Attenuation Capacity (mg/kg)	Soil Saturation (mg/kg)	Construction Worker (mg/kg)	Direct Contact (mg/kg)	Migration to Ground Water (mg/kg)	Default (mg/kg)	Detection Limit (mg/kg)	Solubility (mg/L)	MCL (mg/L)	Residential (mg/L)	Default (mg/L)	Detection Limit (mg/kg)
Benzo(a)anthracene	6,000/2,000		790 c	5.0 c	19 c	5.0 c	0.009	0.0094		0.0012 c	0.0012 c	0.0002
Benzene	6,000/2,000	870	120	8.2 c	0.034 c	0.034 c	0.005	1,800	0.005	0.0062 c	0.005 c	0.005
Benzo(b)fluoranthene	6,000/2,000		790 c	5.0 c	57 c	5.0 c	0.012	0.0015		0.0012 c	0.0012 c	0.0002
Benzo(k)fluoranthene	6,000/2,000		7,900 c	50 c	39 c	39 c	0.012	0.0008		0.012 c	0.0008 c	0.0002
Benzo(a)pyrene	6,000/2,000		79 c	0.50 c	8.2 c	0.50 c	0.016	0.0016	0.0002	0.00012 c	0.0002 c	0.0002
Chrysene	6,000/2,000		79,000 c	500 c	25 c	25 c	0.006	0.0016		0.12 c	0.0016 c	0.00015
Dibenz(a,h)anthracene	6,000/2,000		79 c	0.50 c	18 c	0.50 c	0.020	0.0025		0.00012 c	0.00012 c	0.0002
Ethylbenzene	6,000/2,000	400	29,000	4,600	13	13	0.005	170	0.70	1.6	0.70	0.0005
Indeno(1,2,3-cd)pyrene	6,000/2,000		790 c	5.0 c	3.1 c	3.1 c	0.030	0.000022		0.0012 c	0.000022 c	0.0002
MTBE	6,000/2,000	32,000	38,000 c	190 c	0.35 c	0.35 c	0.005	48,000		0.045 c	0.045 c	0.005
Toluene	6,000/2,000	650	11,000	1,700	12	12	0.005	530	1.0	0.93	1.0	0.005
Xylenes (mixed)	6,000/2,000	410	34,000	4,800	190	190	0.005	180	10	1.9	10	0.005

Notes:

- c = Carcinogen
- MCL = Maximum contaminant level
- mg/kg = Milligram per kilogram
- mg/L = Milligram per liter

**Chemicals of Concern for Site Contaminated with Petroleum Hydrocarbons**

**Table 4.1-2. 0.25-Acre Migration to Ground Water  
Risk-Based Closure Levels for Petroleum COCs**

<b>Chemical</b>	<b>Residential (mg/kg)</b>	<b>Commercial (mg/kg)</b>	<b>SAC (mg/kg)</b>	<b>Construction Worker (mg/kg)</b>	<b>Saturation Concentration (mg/kg)</b>
Benzo(a)anthracene	29	93	2,000	790	
Benzene	0.05	1.0	2,000	120	870
Benzo(b)fluoranthene	86	111	2,000	790	
Benzo(k)fluoranthene	59	59	2,000	7,900	
Benzo(a)pyrene	12	24	2,000	79	
Chrysene	38	38	2,000	79,000	
Dibenz(a,h)anthracene	27	90	2,000	79	
Ethylbenzene	20	300	2,000	29,000	400
Indeno(1,2,3-cd)pyrene	4.7	4.7	2,000	790	
MTBE	0.53	8.4	2,000	38,000	32,000
Toluene	18	360	2,000	11,000	650
Xylenes (mixed)	290	5,100	2,000	34,000	410

Notes:

SAC = Soil attenuation capacity (fraction of organic content x 1.0E+06)

## Waste Oils

Because waste oils may have an unknown variety of contaminants in them, a list of COCs cannot be developed. In specific cases, a person may propose to use the hydrocarbon oil COCs as an initial starting point.